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ABSTRACT

This paper discusses the evolution from the vocational emphasis of librarianship to a new research and higher education oriented concept of library and information science, focusing on changes in the Nordic countries, and Sweden in particular. Recognizing the strong interrelationship between analytical reviews for policy decisions, research and development work, and education for research, the library and information science research situation in Sweden is described as an example of a general complex pattern. Numerous Swedish attempts to design control mechanisms for a coordinated national library and information science program and to institutionalize education for research in library and information science are presented. In conclusion, it is suggested that the thrust of development lies in the information science end of the library and information science spectrum, and that librarians, library schools, and funding agencies should actively participate in furthering the development of information science. (45 references and notes) (Author/EW)

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Education for Research in Library and Information Science

Stephan Schwarz

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EDUCATION FOR RESEARCH IN LIBRARY AND INFORMATION SCIENCE

-- A basis for policy analysis in the Nordic countries

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ABSTRACT

The evolution from librarianship to LIS* is briefly outlined showing a powerful trend towards a new conceptual framework for information provison and processing. Against this background, the Nordic library school system is reviewed with emphasis on efforts to go beyond vocational training programs into higher education and research. **

Recognizing the strong interrelationship between analytical reviews for policy decisions, R&D work and education for research, the LIS research situation in Sweden is described as an example of a general complex pattern. The numerous Swedish attempts to design control mechanisms for a coordinated national LIS program and to institutionalize education for research in LIS are presented.

In conclusion it is suggested that the thrust of development lies in the IS end of the LIS spectrum. If correct, librarians, library schools and funding agencies have to recognize the implications of this statement and the need for active participation in furthering the development of IS and building up a know-how so that significant change in professional roles does not become entirely controlled by technology.

* For simplicity I will throughout this paper use the abbreviations
  LIS = library and information science
  LS = library science
  IS = information science

** There is a minor source of ambiguity in the use of terms like "post-graduate program" and "first-degree course", since library education is often based on previous academic studies. Here these terms will be used with particular reference to the level of studies in librarianship and LIS.

"Il y a plus de livres sur livres que sur autre sujet"

Montaigne

I INTRODUCTION

It should be obvious to users of library and information services in Science and Technology, that the proverbial information explosion is being harnessed by systems developments.It is certainly not more cumbersome than before to retrieve and get access to the literature or to results processed for further use. This dramatic achievement is enough to demonstrate that LIS has come of age. Results currently disclose new problems which no longer can be fitted into and handled by one or another neighbouring discipline. LIS cannot, as it were, live parasitically on established expertise, methods and problem reformulation. Schools of librarianship have taken up this challenge, some with considerable success in establishing research degree programs, some meeting with both institutional and political barriers. I will here speak as a consumer of the output from library schools, a kind of Moloch, who looks with sympathy at their efforts to establish a niche within the research community.

When I wrote these notes I had not seen the "devil's advocature" by Don Revill, librarian at the Liverpool Polytechnic, entitled "You can't do research in librarianship" (1). The author there discusses pitfalls in research in social and behavioural sciences (nowadays often referred to as "soft" sciences of which "library science" is seen as a special case). In brief, the message is really that it is difficult to find a good problem, an uncontestable method of study, conclusive results, and acceptance of practical implications (cognitively and politically).

The relevance of this thought-provoking and witty general analysis of pitfalls in research does not specifically concern library studies and certainly does not entail a rejection of such studies. On the contrary, in the

practice of librarianship there permanently come up critical management problems with a need to carry out, efficiently and conclusively, studies with policy implications. Furthermore, the need to reevaluate functions and objectives and to design new strategies and directions for development nowadays has a scope ranging far outside that of traditional library services. Computer and telecommunications technology is constantly moving the frontiers of information services into new operations, also requiring applied research in many disciplines.

In the research library sector there is therefore a growing need for experience in advanced problem analysis and problem solving, both theoretical and applied, an ability to see the implications of new developments and research results and a commitment and tenacity to fight for new ideas facing both professional resistance (which is also a safeguard against premature decisions) and political/economic constraints.

First degree courses in librarianship normally cannot reach into providing an active instrumentarium and experience for such work. This is why library managers should take a positive interest in postgraduate programs that lead from vocational training through advanced studies up to a component of genuine research.

The concept of "library and information science" (a designation adopted by many schools of librarianship) has evolved over the past decades by the growth of a complex relationship between librarianship and a number of rapidly expanding areas in social and behavioural sciences and in technology (8). For the present situation, it seems fair to say that - on the one hand - technology leads the way in dictating advances in applications, often to a dangerous equilibristic exercise on the edge of feasibility (and the prospect of economic failure). On the other hand, it must be admitted that many systems and services, which should long ago have reached stability of operation are still both shaky and user-unfriendly. Efforts have to be spent both in breaking new ground and on consolidating the advances made in the past.

To understand the present situation in the Nordic countries it is worth while to look briefly at the developments in Western Europe and the USA. Then a brief survey is given of the library school system in the Nordic countries. Some points are made concerning research funding and research programs, which often provide opportunities for a learning-by-doing (apprenticeship) approach to research education. Finally, some conclusions are drawn with some aspects of possible measures to strengthen research planning and education for research in LIS.

II. THE GROWTH OF LIBRARY AND INFORMATION SCIENCE - AN OUTLINE *

Research and education do not necessarily go together, although it may help. A concept of "library science" can in fact be traced back centuries before there were any library schools, e.g. to Gabriel Naudé, Cardinal Mazarin's librarian. The academically solemn term "Bibliothekswissenschaft" was introduced only in early 19th century Germany by "A comprehensive textbook of library sciences" (2), later to be followed by "A catechism of librarianship" (3), (perhaps an expression of a firm belief of the age in the permanency of achievement and understanding). Schrettinger's program was oriented towards librarianship and library processes, including management. More profound and lasting influence came from practice, particularly Panizzi and the British Museum Library.

Formal library education, essentially vocational, was apparently established only towards the end of the century (although a chair was created in Göttingen and also at Columbia University in 1885). Only after WWI (4) was a training program established in a university setting (London). Librarianship as an academic discipline seems to take off from the foundation in the late 20s of the Chicago school (5), with proliferation starting only in the 50s. Generally there is a rapid growth of academic programs after about 1950, extending into research degrees up to PhD level. The most conspicuous development was in Masters level programs, mostly of 1 year, both in Britain and in USA and based on a variety of models for background study and experience (4). These, however, as a rule are not research degrees (the time

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* see ref 45

being required for basics lin librarianship) (6,36). Even in 1975 a 2-year postgraduate course in librarianship, still not on research level, was discussed as a future need (6). Also in 1975 the PhD level in LIS was (reported to be) aspired mainly by library school faculty, frequently for career reasons (6).

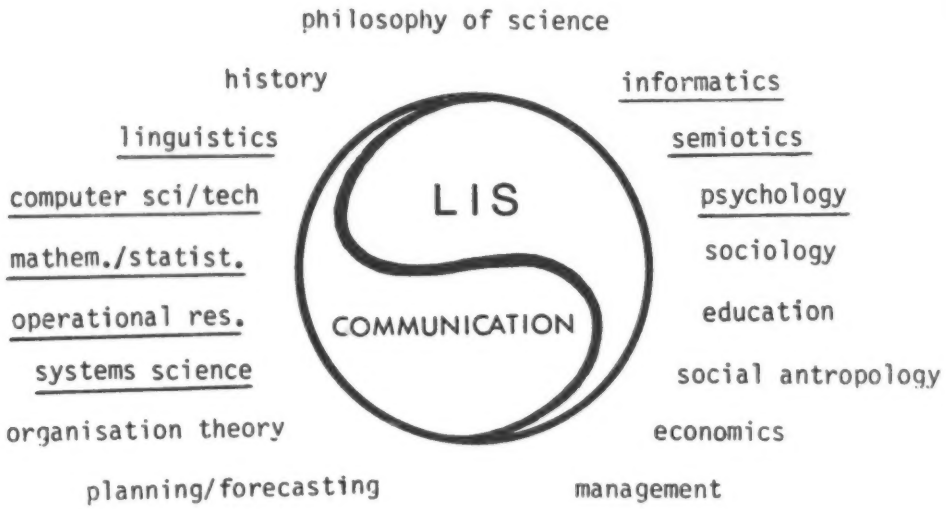
In the meantime the orientation of research and postgraduate education had changed. Early research was mainly humanistic (historical-philological), later to be supplemented with a sociological branch, a trend which is obvious in statistics from the Chicago school in the thirties (5). Alongside this development, the scope of librarianship had widened. The concept of documentation, from the early years of this centruy, and later manifest in FID and the efforts on classification research, was an expression of the need for a new way to deal with the growing literature. Then came the computer age with applications in data base construction - to begin with only as an editing and printing device - and retrieval techniques, data processing, networking, computational linguistics and artificial intelligence - with virtually unlimited potentials for development of information services.

Librarianship has seen its scope change from the tradtional custodianship of document collections into product oriented information-provision obligations within networks of retrieval facilities and information sources. This transition is reflected in a new denomination for related research, "library and information science", and most recently only "information studies" (where "library" has been dropped altogether) adopted by many academic programs - even on the first-degree level - and by journals and societies of the trade. This is also reflected in a transition of terms like "classification and indexing" into "information retrieval", "bibliographies" into "information sources" and "library administration" into "management of information services" (9). (Shifts of this kind are common in schools of technology, as exemplified by "steam power enginerring" converting to "energy systems".)

A large number of US universities offered PhD programs in LIS already in 1972 (10) (although only few with any strength, as reflected by the number

of degrees awarded (8)). Ph.D. programs in LIS were subsequently introduced also in UK. If funding from the British Library R&D Department can be taken as an indicator for the library school research programs, ref 42 gives an interesting picture of the relative weight given to subareas within LIS, with an apparent dominance towards library applications.

The interdisciplinarity of LIS is suggested by the following tentative and incomplete diagram which is really only a list of interlocking areas rather than the kind of cognitive mapping advanced by Price and Small. The figure has deliberately been drawn with "communication" included in the core, representing its close relationship to LIS and its parallel links to the interfacing disciplines.



Schematic indication of the disciplinary connection to LIS. Underlining suggests that the connection extens into the "hard" IS-end of the LIS spectrum (adapted from ref (16), cf also (7) and a number of references on IS).

If it is possible to speak about a "spectrum" of disciplines representing the range from librarianship and library science (in the traditional sense) to science and technology of information, communication and computers, the areas underlined would seem to extend into the "hard" IS-end. (I here use the notion of a "hard science" etc in a sense akin to Derek Price (ref 40)). It is important to note that in many instances, both in discussions and postgraduate programs, the term IS refers to an area somewhere in the middle, including e.g. studies of information flow in special user groups or the social impact of computerized services. This nomenclature is of course perfectly legitimate but it will be avoided here, because I want specifically to make a point about the significance of the "hard" IS end of LIS. (I stress this point to defuse the reproach of trying to to depreciate work in LS and the middle range. On the contrary, such studies yield the feedback needed as input to policy formation, also concerning applications of new IS-based options).

The present view of the "hard IS-end" of the LIS spectrum (cf also ref. 38) is highlighted by the official scope defined for the North-Holland journal "Information Sciences" which reads:

.....
Readers are assumed to have a common interest in information science but with diverse backgrounds such as engineering, mathematics, statistics, physics, computer science, management science, library science, biomedical science, and behavioral science. Emphasis is on both theoretical and experimental work that is of deep conceptual significance. The scope of the journal includes computer linguistics, data structures, database management, distributed processing, fuzzy information processing, image processing, information storage and retrieval, knowledge systems, management information systems, natural-language processing, pattern recognition and software engineering.

A similar view of the significance of IS in the context of LIS is apparent in Saracevic's 1970 selection of readings in IS (39), in the curricula proposals for IS by Kunz and Rittel (38) and generally by the acceptance policy of the Journal of the American Society for Information Science.

Areas such as those underlined, in themselves interdisciplinary, zoom into a large number of R&D areas with implications for library services (8), like computerized indexing, machine translation, content analysis, file organization and architecture, retrieval logic, query processing and diverse applications derived from efforts in artificial intelligence (on the service side) and cost-benefit analysis, systems design and operations research (on the management side).

This gives rise, for a part of a curriculum, to areas as defined by the Institute of Information Scientists (1982) criteria for Information Science which "cut across conventional librarianship courses" (9).

Discussions around 1970 emphasized the "nature of information" as a subject of research, and a systems approach coloured by ideas from areas like cybernetics, control theory and perhaps general systems theory, and applied to artefacts and organic and social systems (8). This view carries over into conceptual analysis of "information science" with a strong emphasis on the psychological and social components (8, 11). It appears that this emphasis has given way in the last decade to a more technology-oriented information-processing view, reflecting the fact that technological developments in computing and communications have a decisive impact on development in "library and information science" and on information services and librarianship. This impression corroborates an hypothesis concerning the general interplay between science and technology, forcefully argued by Derek Price (43).

The shift in emphasis (i.e. a "hardening" of IS in the LIS-context) gives rise to research on "man-machine interface" (to use a modern catch-word) and to studies of the social and psychological impact of information technology, the results of which should have an impact on IS, hopefully not as "technological fixes" but as a constructive dialogue prompted by practical considerations.

This brief (and somewhat rhapsodic) account of the emergence of LIS does not do justice to the wealth of research contributions, coming from the LIS-departments, library professionals and scholars in interfacing disciplines, often applying recent advances in areas concerned. There has also been a feedback into other areas, e.g. research on the sociology of science and on the dynamics of scientifc growth made possible by citation indexing. Developments in IS (like computer-assisted processing of chemical structures and reactions, or the simulation of thermodynamic properties of compounds from basic numeric data) tend to eliminate the demarcation between information services to an area of research and the actual research process. To this comes of course the new roles and sometimes the bypassing of intermediaries in information retrieval. Perhaps, ironically, the quest for an academic identity as LIS, by the nature of its contributions to the research system, brings about a weakening of the professional identity of "librarianship".

The development from traditional library services to general information provision seems to be acknowledged in the 1976 IFLA Standards for library schools (12), although the definitions "library science", "information science" and "informatics" do not give much guidance for curriculum development. One key issue for research-level training is to avoid unrealistic designs

which cannot conceivably be filled with a proper content of sufficient depth within the time span available, and where practice will inevitably fall short of objectives. What is needed for recruitment to research library staff, is not a person who can actually carry out research-front work in a narrow field, but one who is capable to identify and analyse the relevant problems (where a solution would really make a difference) and recognize the kind of interdisciplinary effort needed to arrive at a workable solution. To use the analogue of medicine, suggested by Saunders (13), research problems are derived from clinical experience but solutions that do more than screening the symptoms may come from areas outside, like microbiology, genetic engineering and even mathematics (like computed tomography).

It seems likely, however, that from the funding point of view "library and information science" is primarily an "applied science", a Hilfwissenschaft for the evolution of information provision. The central problems of librarianship (or information servicemanship) are derived from practice, and they are mostly peripheral to the disciplines invoked for solutions. The justification for research, both theoretical and application-oriented, must come from the "chief mourners" - in this case the departments of librarianship and the information service centres. They are also best equipped to argue for the importance of long-term commitment to basic studies - whose benefits are not, as a rule, quantifiable in advance - to balance projects with immediate operational results (which are more often than not surprise-free, and therefore not unattractive to application-oriented sectorial funding agencies). And such programs on basic problems are needed, along with - as stated by Mc Garry (9) - "a great investment in time and effort in order to build up a research team in a school and to instil research values in staff behaviour".

In the sequel I will distinguish IS in the LIS-context as a relatively hard research area bridging the domain defined by the IS criteria just referred to, and the possible applications, to library and information services in a wide sense. This view is in line with the advanced IS-programs in many British and US university departments of LIS, described in detail already in Foskett's 1972 review (10) e.g. for Lehigh University and University of Michigan. When

I therefore conclude (or get the impression), in discussing the research activities of different institutions, that activities lie predominantly in the LS part of the LIS spectrum, this is in no way an evaluation of the quality of research, nor of the importance of the results. If anything evaluative, when summing up the total review of the Nordic scene, it is a suggestion that the IS-end of the spectrum is underrepresented as to research activities relative to the weight it ought to be given if control is to be retained over the technological developments.

If this analysis is acceptable as an account and an interpretation, it has some bearing on strategies for developments in the Nordic countries since the message is hitherto not always clearly articulated in proposals for institutionalized research and education-for-research in "Libary and Information Science".

III. THE PRESENT LIBRARY SCHOOL SITUATION IN THE NORDIC COUNTRIES

This has been presented most recently in a special issue of the Scandinavian Publ. Libr. Quarterly (14) and in a booklet - Nordic library schools, a guide - issued by Nordiska Ministerrådet (15). The overall picture is determined by differences in post-secondary education and in the routes to positions at different levels in the library systems of the countries.

In Denmark formalized library courses outside the libraries were introduced on a limited scale in 1918. In 1956 the Royal School of Librarianship was created, however not within the University of Copenhagen. It has developed into one of the largest institutions of its kind in the world. In 1973 a branch was set up in Aalborg. There is one 4-year program for public library staff and another 4-year program for "librarians" in research libraries, both starting from the secondary-school level. A merging of these two "sections" is now being considered. The subject specialist positions in research libraries are open only to so-called "academics" holding a university degree on a Masters or PhD level. Since 1969 there is a two-semester training program for this category, concluded by diploma work (about 80 reports to date).

These "research librarians" have a right to use 20 % of their working time for research, either within their speciality or within LIS - although the latter output is rather limited. The school also offers a large number of short extension courses for continuing education of library staff. The educational programmes relate in an interesting way to the practice of librarianship - apart from the obligatory library practice periods for students - by a system of external lecturers and censors. These are brought in from libraries, as a rule, higher administrative grades with academic background, to contribute to courses and to participate in examinations.

In the statutes for the library school there is a provision for faculty to do research on part-time, up to 20 % of the total manpower resources. Project proposals are submitted to a committee for approval. Apart from humanistic and social science oriented work there are examples of computer applications in education and in library functions (17). LIS-related R&D projects based outside the school can be exemplified by the work on computerized integrated library systems at the National Technological Library, and the program on Linguistic Aspects of Information and Documentation within the Institute for Applied and Mathematical Linguistics in the University of Copenhagen. A major study is under way on the impact of computers on the conditions in library and information work.

In Finland a report of a Joint Committee for Library Research from 1969 lists a number of priority areas, which by present standards would be characterized rather as development and analytical survey ("utredning") work (18). At the time there was no advanced education in librarianship. Now there are departments of LIS in the University of Tampere and Åbo, both awarding Masters of Social Sciences degrees. In Tampere there was during the period 1946-1981 a diploma course on a non-academic level which, combined with an academic degree on Masters level (subject specialization), gave access to positions as professional librarian. The present department was founded in 1972 with the aim to create a single coherent curriculum for librarians. In addition to the original chair in LIS there is from 1982 an associate professorship in LIS and from 1983 an associated professorship in "informatics". The objectives of the curriculum

are stated, apart from the mastery of library processes, to develop analytical abilities, a scientific attitude to the role of information services in research and society, and a basis for involvement in research. The duration of the program is 4.5 - 5 years, starting from secondary school, incorporating roughly 1.2 years of studies in other departments, 2 years of basic studies of librarianship, 0.8 years of advanced studies in LIS (including theoretical and practical aspects of research work), and 0.5 years of thesis work. It should be added that LIS can be studied as a minors subject in a Masters degree, with a minimum of 20 study weeks.

There is also a program for postgraduate studies (licentiatexamen), including studies in another discipline, a reading assignment of advanced literature in LIS and a thesis approximately on the level of a US PhD. Finally there is a degree of Doctor of Social Sciences, which, according to academic standards in Finland, is a very extensive undertaking. So far 6 students have passed licentiatexamen, of whom 2 have continued to the Doctor's degree - these numbers have to be compared to the examination in other departments and no doubt represent an achievement in establishing LIS as an academic discipline. The higher studies are individualized, which means that there is no common core curriculum. "The research activities of the institute place priority on the study of the societal connections of information from the point of view of services provided within the scope of libraries and information services" (19).

The department of LIS at Åbo University was created in 1982. It offers a Masters of Social Sciences program (taught in Swedish), closely related to that at Tampere (a vocational course with extensions was offered from 1973-1982 in co-operation with the Tampere department). Programs for higher studies will probably start in the near future (20).

The Norwegian School of LIS was founded in 1940 with a 5-month course in librarianship, soon extended to 10 months and - by the end of the 40s - to a 2-year program with separated 2nd year for public and research library specialization (21). This program was discontinued in 1974. (There also used to be another route, viz. an academic degree (BA-level) combined with shorter courses and a period of apprenticeship in research libraries). From

1972 the School has offered a 3-year program with a large common core and a number of optional courses in the last two years. A new curriculum was introduced in 1981. A number of shorter courses for continuing education are offered. A proposal for a 2-year education-for-research program, worked out in 1971-76 was never put into practice. However, in January 1984 a new 2-year postgraduate program (presently 10 students) in Information Science was introduced - in fact the only one of its kind in the Nordic countries. According to the brief description available (22) this is a curriculum focussing on computer applications in information processing and services, with a relatively strong base of theory (mathematics, statistics, systems theory, computer science). A diploma work of 1/2 year is to be performed in a practice-oriented environment.

Teachers have no regular research opportunities, but there is a grants program enabling faculty to take sabbatical leave for research. Most of the projects listed (11) seem to fit into the LS side of the LIS-spectrum, but there is a computer dialogue and networking project which obviously falls within IS in the present sense.

The Swedish School of LIS was started in 1972 and since 1977 it is part of the University College of Borås. It runs a 2 year program, based on the requirement of 2 years' prior academic studies - or practice judged to provide equivalent background. After the first year there is a bifurcation for the public and research libraries respectively. A brief diploma work is required. In the last semester there is an optional I&D program, including an introduction to computerized I&D services.

The general objectives of the 2 year diploma program have been stated in a way presumably embraced by most first-degree courses in librarianship on the post-secondary education level (14):

- to equip students with the necessary professional know-how and knowledge regarding the media, activities and tools of libraries
- to give students an in-dept and all-embracing appreciation of the role of libraries in society

- to foster in students the ability to view critically the objective and activities of libraries
- to provide students with the foundations necessary that they may, as professionals, actively participate in the furtherance of librarianship
- to impart, from a scientific basis, knowledge of the theories pertinent for libraries for the treatment and communication of information in its widest sense".

The school also gives a 20-week course for "library assistants" without academic background and a large number of shorter courses for continuing education. A quite ambitious 20-week program in "informatics" for I&D work in research, industry and administration has been started in 1984. Pre-requisites are library school diploma of three years academic studies and some working experience. There are a number of projects run by faculty members, but at present there is no postgraduate program leading to research level.

Since I am familiar, at least to some extent, only with the Swedish situation, I will here attempt to give a more detailed account of various R&D policies, funding resources and projects related to LIS as understood here (i.e. mainly following conceptual practice in USA).

IV. FUNDING OF R&D IN LIS IN SWEDEN

Before going into the R&D activities outside the library school, the funding situation has to be mentioned. Projects which are not funded within the executive agencies' own budgets (university dep't, library, research institute) can receive funds from a number of sources, like National Research Councils, the National Board for Technical Development, the National Bank Foundation and so forth. For LIS, like many practice-oriented areas, they key issue may be secondary to the different disciplines involved in the analysis, and results regarded rather as applications or spinoffs than basic advances. Therefore LIS-proposals were at a disadvantage in the competition for funding. To remedy this problematique, a sectorial research council for development of I&D systems in S&T (SINFDOK) was created in 1968, in

response to recommendations from OECD and Unesco. In 1979 (after extensive committee work which gave a remarkably comprehensive and far-sighted review of the situation and the trends of development (23)) it was replaced by the Delegation for S&T Information (DFI), with wide responsibilities for policymaking, planning, development and co-ordination in information services and in LIS, inter alia to:

- formulate long-range plans and guidelines for the provision of scientific and technical information
- coordinate and promote national use of existing resources
- follow technical developments
- plan, initiate and, itself or jointly with other institutions, support research and development
- when needed, initiate education, especially long-term educational programmes

DFI support for R&D is given with present priority for:

- better utilization of existing resources and services
- document delivery
- systems for computer-based handling of texts and pictures
- basic research on information as a production factor.

The annual budget (1983/84) was about 2.3 M USD of which 1.2 M USD are available for funding of R&D projects proper, and 0.4 M USD for support of the biomedical and technological information and documentation centres in Stockholm.

Similar bodies for policy formation and funding (with local variations), have been established in other Nordic countries. On the Inter-Nordic level the counterparts were NORDDOK (1970-76) followed by NORDINFO - the Nordic Council for Scientific Information and Research Libraries. NORDINFO's responsibilities include to "initiate, carry out and support studies and projects on development of methods, systems and education, and to some extent operational activities promoting information, documentation and research library services" (24). The budget for 1983/84 is about 0.4 M USD.

There is naturally some co-operation between research councils and foundations, so that projects can be funded from several sources. The total amount deployed for R&D-work referrable to LIS will therefore be higher than the budget components quoted. On the other hand even good projects may fall "between chairs", which is inevitable in any system, but the principle of sectorial funding in a sense carries with it a further reduction of independent alternatives and generally of the redundancy. This effect also appears in evaluation and refereeing in a centralized R&D system.

As always in application-oriented R&D, the line between "advancement of knowledge" and "making things work in practice" is not easy to draw. It is not always recognized that the cost of going from a prototype to a "fool-proof" product may easily amount to one order of magnitude on top of the cost of research for the prototype. Money available for research in the "advancement of knowledge" sense is therefore only a small fraction of the funds spent on R&D. On the whole, however, a generous atmosphere has been created by DFI and it appears to have been relatively unproblematic to receive funding for well-conceived proposals of limited dimensions - in particular if objectives include operational returns of a "general interest". The major difficulty (with a rigid salary structure and weak career prospects) is in recruiting project staff with analytic and imaginative capacity and some research experience, in particular in the IS-end of the LIS spectrum (cf ref 42 for the British situation). This evidently is a challenge for higher education in schools of librarianship.

V. R&D IN LIS-RELATED AREAS IN SWEDEN

Traditionally, library research was of course humanistic - often pursued by scholarly librarians - and later turning to sociology and behavioural sciences. At present, studies in sociology of literature are carried out e.g. in Uppsala (29). In the department of Sociology, Umeå, a group working under the acronym of INFORSK (inf. research group) has developed a formidable skill in using scientometric techniques, like citation analysis, bibliographic mapping, zooming and so forth and also traditional methods of the sociology of science, to study the creation, flow and consumption of S&T information

in various groups (25). A team working in quantitative linguistics (KVAL) has been active since the 60s in research with implications for IS and LS. A computer software group (PARALOG) has developed an internationally acclaimed information retrieval and processing system for large textual databases (3RIP). More or less straightforward applications of mainframes, minis and micros have been worked out in research libraries in Stockholm (EPOS/VIRA for SDI-services, RAMAS for automated periodicals control, etc (26)), in Linköping, Lund and Göteborg. A long-term program on user training and marketing of information services is conducted at CTHB in Gothenburg. A special kind of management studies, involving political, psychologic and economic considerations relating to provison of research information for developing countries have been carried out by missions from KTHB (Stockholm) and Lund. A research group for LIS-studies was started in Linköping in 1982 as LIBLAB, focussing on applications of methods from artificial intelligence to the design of so-called Expert Systems for cataloguing and the design of data bases for a new kind of associative retrieval (27, 34). The department of Information and Systems Science in Stockholm (jointly at the University and KTH) defines its area in a way that extends from Information Science in the LIS-sense, into computer science, communications research, control theory and general systems theory. It offers a 1-year curriculum with extensions to Masters and PhD level. About 30 different courses, which can also to some extent be followed independently, are run by the department.

The Technology Faculty, Linköping, has departments for Computer Science and Computer Systems. A program for LIS has been suggested (not operational at present), which covers a wide range of the technological aspects of IS. On the purely educational side one could mention the continuing "Stockholm seminar in LIS" at KTHB presenting an opportunity to discuss R&D projects and a forum for foreign scholars visiting the area, sometimes for extended periods as "visiting professors". An international training course was organized by KTHB (with CODATA and Unesco sponsorship) on development and applications of non-numeric data banks in S&T.

One important educational measure funded by SINFDOK and DFI is the fellowship system, providing a salary for up to 3 years for a number of individuals who enter priority areas. About 25 fellowships have been awarded over the years, with a dominance in later years (DFI-period) towards the library services and library science end of the LIS-spectrum. One doctoral dissertation (on the growth of demand for information services) resulted from a fellowship to Forrester's Systems Dynamics group at MIT. A number of dissertations are under way, either to be presented in British LIS-departments by special supervision arrangements with CTHB (Gothenburg), or to be presented in Sweden but supervised (in part) by British LIS-scholars. Discussions along similar lines between KTH and the department for Information studies at Drexel University, Philadelphia, are under way.

From NORDINFO funding has mainly been awarded to application-oriented projects, like inter-Nordic union catalogues, but there are also research level contributions, like - on the educational side - the four one-week research seminars under the common heading of "Nordic Education in LIS" including "Linguistic aspects of I&D" (1979), "Bibliometrics" (1981), "Construction of thesauri" (1982) and "Problem solving in libraries" (1984).

This catalogue of Swedish (and some Nordic) R&D-projects readily within LIS is by no means exhaustive. A fuller picture including policy issues would emerge from a study of the SINFDOK, DFI and NORDINFO archives on research proposals (also rejected ones), funding discussions and eventual evaluations. Most of the work referred to has received full or partial funding from these bodies.

It seems that the international visibility of Nordic work in LIS is relatively modest, and it could certainly be improved by systematic publicizing and distribution of reports. Search in LIS, LISA and ERIC on the Lockheed system gave very few hits for work of Nordic provenance, particularly when disregarding discussions about the LIS-area rather than within. Quite a few references expected to be retrieved were missing. One contributing factor is that projects are not always reported in the journal literature but in report series which are not systematically covered. Also, the policy for coverage of

these databases may not coincide with the entire spectrum of LIS as conceived of here.

A significant part of the LIS-projects are carried out without any link to a university department and with no particular aims at academic degrees or credentials. In other cases, the work is carried out within or under the umbrella of a department willing to accept the theme as appropriate for a dissertation relevant to its regular research program or at least within its scope. This of course implies that the candidate should meet the requirements of fundamental studies in the department's discipline, in Sweden normally 1.5-2 academic years. For most graduates from the Borås school, this raises the question of a "gap-bridging course" to be discussed in the sequel.

It should be noted that education on research level is highly individualized as defined by the supervisor for (or with) the student, including a core of advanced reading assignment (sometimes amplified by seminars and lectures) and a dissertation theme. The institution provides the intellectual environment, a research tradition (specialization, standards of excellence, continuity and an international peer network) and - depending on the supervisor's research style - some kind of apprenticeship (particularly since the advent of "big science" and teamwork). For dissertation work it is often necessary but anyway wise to stay within the institution's main thematic orientation, because this is where support can be really effective.

External status (i.e. being associated with - but not working within - a department) gives rise to some problems, e.g. that the research theme might originate from extra-departmental interests (and may not naturally fit into the regular program), that the student's low presence may affect the department"s commitment, that interdisciplinarity of the problem gives rise to methodological difficulties outside the departments experience and disagreements in evaluation of results etc. It is to be expected that active recruitment of research students for LIS cannot be strong unless a

department has specific interest in (a part of) the area, and important subareas may receive too weak attention or remain ignored.

A general conclusion, valid in the Nordic countries, is that projects referable to LIS are to a large extent carried out outside the library school system and that consequently training on the research level rather follows the traditional scheme of "learning-by-doing" in an appropriate intellectual and functional environment. There are obvious problems, of continuity, coverage, level of performance etc associated with this ad hoc situation.

Although it is evident that LIS by its nature has to depend heavily on existing research programs in many areas, the unfolding of LIS as a recognized area seems to require some kind of instituionalized responsibility. The main tasks that come to mind (e.g. to survey all R&D with an impact on library and information services and to promote the formation of research groups competent to deal with the multidisciplinary problems of strategic importance to information provision) seem to fall within DFI's obligations. An immediate question is whether this solves the problem, or whether there is a need for an academically based body to create an equilibrium. It is therefore interesting to see how the idea of an institutional framework has been approached in the very extensive discussion on LIS and training for LIS research that has gone on since the late 60s, again referring to the Swedish scene.

VI. ANALYTICAL SURVEYS FOR PLANNING OF EDUCATION AND RESEARCH IN LIS

This debate, summarized up to the late 60s in (28), departs from the humanistic-educational-sociological perspective derived from public library practice and the concern for a wider dissemination of literature (cf 29). It was revived in 1978, when the Borås school initiated its committee on research extension of its first degree program in librarianship. Numerous articles in Biblioteksbladet (the bulletin of the Swedish Association of Librarians) address old questions like "Can there be any scientifically acceptable LIS?", "What is its subject matter?", "Where should it be carried out?" and "What shall we do with a (drunken) library-and-information scientist?" (30). (Funding was anticipated largely from DFI which was about to be established (25)). The serious concern was of course that of being left behind. The international development of "library studies" into a LIS, the research-level programs in British and US schools of librarianship and the lack of manpower with LIS-related research experience in the Swedish library system had been keenly observed by participants in the debate (educators, systems developers and library administrators). Three organisational models for research in LIS were suggested: an independent research institute, a co-ordinating and initiating research centre in the Borås school, or relying on LIS-related research to be initiated and carried out in existing research environments. The discussions generally focus on the LS-end of the LIS-spectrum. The middle range (e.g. computer-based I&D-services and systems) is mentioned, but the "hard" IS-end is not really considered to be part of the concern.

The debate received - as was just mentioned - much impetus from the committee on a "program for library research" set up by the Borås school and working in 1978-80 (31). Starting from the general principle that "higher education should be built on scientific foundations" the committee identifies five central themes:

1) The library as a knowledge base
2) The library in society

3) The library and its users
4) Reference work
5) Library management

The emphasis is clearly on the "library" side of the LIS-spectrum. This naturally follows from the original objectives of the school and from the directives of the committee - the mandate intentionally included only a restricted IS-element in order to generate a realistic program from the conditions present. It is suggested that a nucleus for an LIS research department be established in Borås, with capacity to keep up international contacts, follow up developments and initiate a research program. Facing the problems of "critical size" it is proposed that priority be given to "user studies" to be carried out in co-operation with university departments. This focus would probably have been a good strategy since, e.g. in co-operation with the Chalmers University of Technology Library and a number of British LIS-programs, an expertise in the use of quantitative methods could be attained which could later be applied to other problem areas.

The library school proposals gave rise to a new working party (1980-83) for a propedeutic "gap-bridging" program leading from the basically vocational library diploma to the research program level. As a rule, 1.5 years' studies in the fundamentals of a discipline (within the first degree program) allow students to enter research programs. The main question was whether to accept the necessity to rely on other institutions for research, or to create conditions for an indigenous postgraduate program for a research-oriented Masters degree in LIS. The latter strategy was given priority, with a gap-bridging course of one semester (20 weeks), half of which is for diploma work. The overall objective would be to develop the participants' ability to carry out a study on their own within one area in LIS by providing basic theoretical insights (theory of science, research methodology - particularly statistics - and project management) and an understanding of the sub-areas of LIS.

The curriculum outlined was very ambitious and certainly would meet the objectives. The possible question that might be raised is whether it is

possible to absorb as an active tool for subsequent studies such an amount of technical, philosophical and problem-analytical material. The obvious answer is that this is a concentrated introduction to ways of thinking which have to be continuously deepened as later research work proceeds. Hopefully it will be possible to raise funds for detailed curriculum development, production of reading materials, and associating experienced teachers from departments for philosophy of science and statistics. Many active librarians, who in their professional duties have to carry out investigations for policy adjustments, would profit from this course.

In 1981 a working party was set up by DFI with a short-term mandate to:

1) define and delimit the area of library research and analyze its connections to other areas of R&D within the scope of DFI

2) produce a survey of Swedish and international library research, its objectives, trends of development and organization

3) evaluate results of earlier research and its relevance and applicability in the Swedish context

4) propose a policy for DFI support of library research by selecting subareas and problem aggregates worth special interest

5) estimate requirements for funding at different levels of ambition

6) discuss problems related to manpower development, organization and co-ordination of research programs and the possibilities of harmonization with other ongoing research.

This extremely wide-ranging task obviously had to be delimited by the group to be manageable within the resources available. A full report of the work has not been produced.

The problems of bridging the diploma-to-research gap and of linking small colleges to university institutions for research co-operation are the object of a new study carried out by the National Board of Universities (UHÄ). The definition of LIS and delimitations or dependencies vis-à-vis other disciplines are to be clarified. Further, the expediency of a "general R&D program in LIS" and possible organizational structures are to be explored, where the

needs of the Borås school for research associations are to be given particular attention. One conceivable model is that the Borås school is given a co-ordinating and planning role as a "LIS-research centre" linked to other institutions with related research interest. The presence of an IS-component is recognized, with a special concern for LIBLAB as a resource for research and education. Obviously, DFI has to take an active part in this study due to its general planning and coordinating responsibilities.

All these planning efforts have a common feature, namely a major concern with the "library services" and the LS component. A number of DFI-supported surveys deal - on the other hand - specifically with strategies for development of the IS component. One, "A framework for a future Swedish policy for R&D in information science and technology" (32) was written by the PARALOG group. This is comprehensive survey of the "hard" IS&T (information science and technology) area related to information services in a wide sense, both concerning the international developments and the Swedish scene. It amply shows the wide range of R&D areas which have an immediate or a prospective impact on means for information provision. In particular the authors warn that a breakthrough in hardware technology can make a large investment in software technology obsolete. A number of proposals are formulated with a view to co-ordinate and strengthen the advancement of IS&T in Sweden.

Another IS-oriented survey, "A study on directions for R&D in Scientific and technical information systems" (33) is a collection of papers from the Software Systems Research Centre and the Computer Architecture Laboratory in Linköping in conjunction with the University Library. Finally, there is the planning document for creation of the "Library Research Laboratory (LIBLAB) in Linköping (18) and a program presentation with an introduction to the philosophy of LIS (34). The planning document sets out with a panoramic view of library functions. The area of LIS to be studied is then defined by

a) models for document description and representation
b) interaction of users and library systems
c) networking

The idea of LIBLAB as a national resource for research and education in LIS, with an implicit focus on the middle range and the IS-end of the LIS spectrum, has created great expectations, and funding was allocated for an initial 3-year phase. The actual projects which address a number of profound and difficult problems of IS with clear library service applications, are hopefully of manageable dimensions, considering the present staff of only 3-4 persons.

VII. SOME COMMENTS AND SUGGESTIONS

It is shown that library education as academic programs is a relatively late phenomenon with significant proliferation only in the 50s. From these programs recognition emerges that the development of librarianship requires systematic study of many problem areas partly overlapping established disciplines The common feature is an interest in cognitive processes and the growth of knowledge by the transmission and processing of information, (although the meaning of the term "information" is generally context-dependent and somewhat "fuzzy" (35,37,41,43)). The rapid development of computer and communication science and technology and their impact on information services gave rise to the understanding that "library services" have to evolve into the wider area of "information services", with an inherently unclear delimitation of professional responsibilities - even extending into participation in the use of information for R&D.

The concept of IS, implicit in programs of education, research and applications can perhaps be captured in a statement like:

"Information science (IS) is concerned with the structure, content and representation of information and its collection, processing, storage, retrieval, and transfer".

It is clear that IS, conceived in this way would include LS as a sub-area. The question for schools of LIS or "information studies" and their research programs is how much ground one should cover in the different directions opened up. There will be no simple answer, but rather a challenge to

establish, by actual contributions, a profile that fits functionally into a context of education, R&D and a potential manpower market.

It is, however, plausible that developments in library and information services that really matter will be made possible by advances in computer and communication technology and their applications to IS. It therefore seems crucial to admit the inbalance that - in a sense - LS needs IS but not vice versa. This means that only by a concerted effort will results from IS&T be systematically assessed for their potential utility and brought to bear on library and information services. The review of programs in schools of LIS in the Nordic countries appears to suggest that in most cases these schools define their niche to cover the LS and middle range of the LIS-spectrum. This is a wide enough area in its own right and such a conception is perfectly legitimate, in particular as many interesting ideas and important problems would not otherwise be treated by the research system. One exception is the new IS-program in the Oslo school, which should be followed with great interest as a "benchmark experiment". Programs like those in the Stockholm University Department of IS and in Linköping - and in fact most research in IS (in the present sense) - so far seem to be unrelated to library school R&D programs .

I feel convinced that this image is not the effect of a wanted demarcation to the hard IS-end of the LIS-spectrum but of other factors related to the fast growth of IS and the restricted economy of the library system including the schools of librarianship. This impression is corroborated by the somewhat sombre final comment in Tefko Saracevic's 1979 essay on information science education (8). Some of the planning documents referred to in the present survey clearly indicate an awareness of the need of an integrated approach and the growing role of IS for information provision. It should therefore be readily justified to ask whether the sound development of library and information services does not require a growing emphasis on the part of advanced LIS education programs on what has here been called the "hard" end of the LIS-spectrum. The schools of LIS have an important role to play in identifying talent to be recruited for R&D, whether in the school's own research, or subsequently in other research environments or in libraries.

They also have an important role in continuing education of library staff, transmitting a working knowledge of new developments and trends sufficient for making policies and strategies for action. As to funding of R&D and associated on-the-job education for research, sectorial research councils certainly have a lot of experience on how to create a proper climate for R&D, how to co-ordinate programs and resources, and how to initiate a comprehensive coverage on important areas of development. Yet a centre for LIS of the kind suggested by the Borås school and the Board of Universities, whose research is not necessarily localized to one single institution and with a certain financial independence, might become an interesting and constructive counterpart in a somewhat more pluralistic system for policymaking and in the difficult balance between Research and Development. Whether this is conceivable and feasible in a small system, and whether it would be to the advantange of effective partaking in the international development, depends largely on incentives to make both teaching and research attractive.

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.....

There are still only a few people engaged on basic (information) research, most of whom have been involved with it for a long time and several of whom work in automatic indexing or related topics. The main problem is to encourage movement into this work of new, able researchers from the variety of disciplines that can contribute to it."

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